Village of Solomon Affordable Housing

University of Alaska Fairbanks
Bristol Bay Campus

Team Asriavik

Solar Decathlon Design Challenge 2022: New Housing Division

Rural Alaska Single Family Residence

VOS Home Design rendering, captured from Cedreo design software, 2022

Village of Solomon's (VOS) Affordable Housing Plan

Tribe:
Displaced community facing housing shortages in Nome, Alaska

Plan aligns with Tribal Resolution adopting Paris Agreement

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Photo of VOS Tribal Members in Nome, Alaska; used with permission from VOS Tribal Council

City of Nome, Alaska

64°29'46.5"N 165°22'28.1"W

Undeveloped tundra
(permafrost, coastal conditions)

Climate Zone 8: Subarctic

14,000 Heating Degree Days

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Map image of the City of Nome Zoning Map; adapted from the City of Nome website and Zoning manual

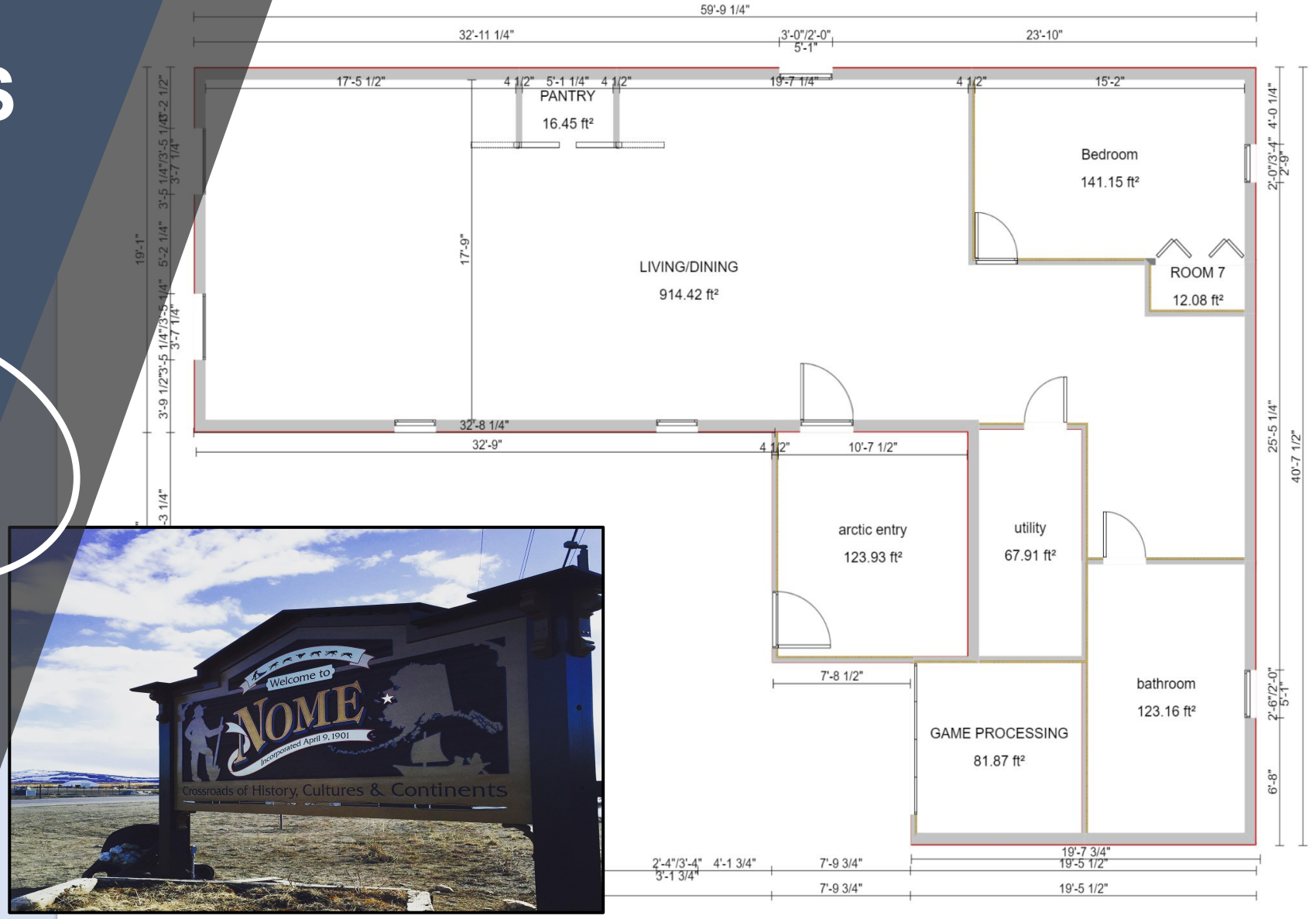
DESIGN GOALS

MULTIGENERATIONAL
Architecture
Occupant Experience
Embodied Environmental Impact

ENERGY EFFICIENT
Energy Performance
Integrated Performance

EMERGENCY SECURE
Durability & Resilience
Comfort & Environmental Quality

REPLICABLE
Engineering
Market Analysis



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Architectural floor plan rendering of VOS Home, ground floor design, developed with Cedreo software, 2022

"Welcome to Nome" sign, Nome, Alaska, used with permission from A. Toerdal, 2017

MULTIGENERATIONAL

Architecture, Occupant Experience & Embodied Environmental Impact

Built in food Storage
ADA Compliant floor plan

Two-story structure with sloped roof; built to withstand extreme cold and snow

Hybrid construction of shipping containers and traditional timber

Culturally focused: subsistence lifestyle, big game processing room, gun security

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Photos of VOS Tribal Members at Solomon Community Center with berries 2021, and at a traditional fish camp, 2020, used with permission

Design layout and rendering of VOS Home, using Cedreo software, 2022

INTEGRAL FEATURES

Engineering, Occupant Experience, Energy Performance, Integrated Performance, Comfort & Environmental Quality

Account for Seasonal Daylight Changes

Empathize with Cultural, Multigenerational, Age-In-Place Needs

Ductless Mini-split Air-Source Heat Pumps

HVAC system and ventilation improves air quality while maintaining comfort

Smart thermostats for ease of use

Window placement for solar gain

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Background stair image, Plug-In LED Motion Sensor Night Light by Auvon

Smart thermostat stock image from Canva pro

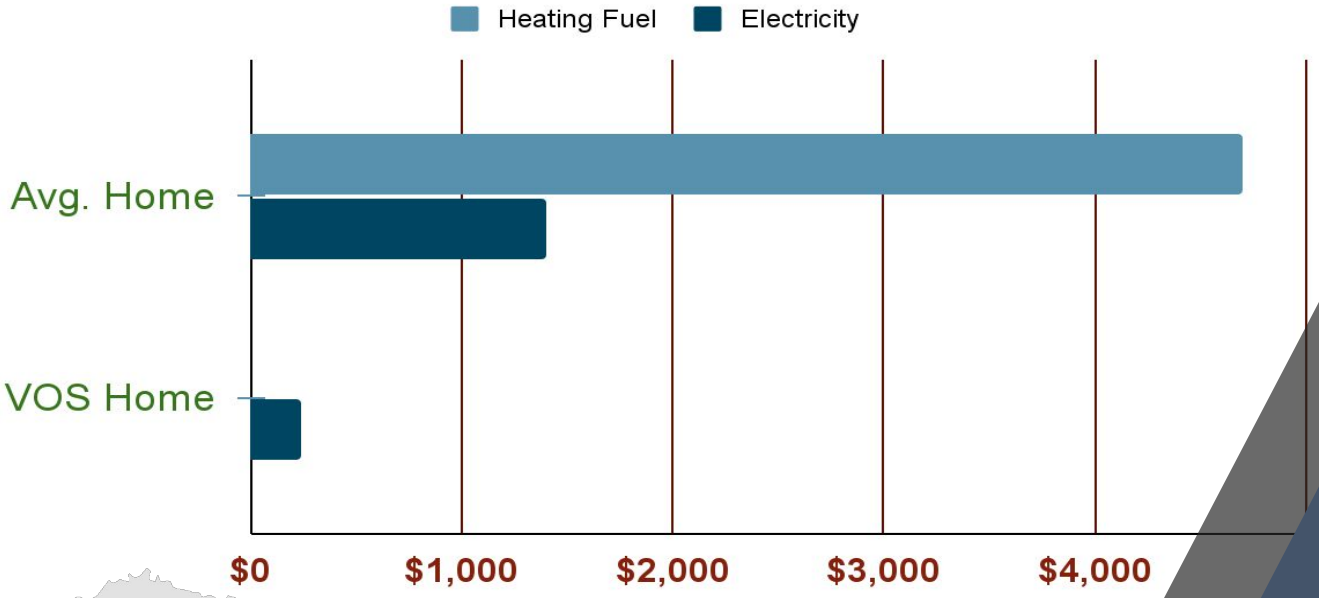
Air source heat pump in northwest Alaska, photo courtesy of Ingemar Mathiasson

Home Energy Rating Certificate
Projected Report

HERS® Index Score:

-3 Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

Heating Fuel and Electricity



ENERGY EFFICIENT

Energy & Integrated Performance

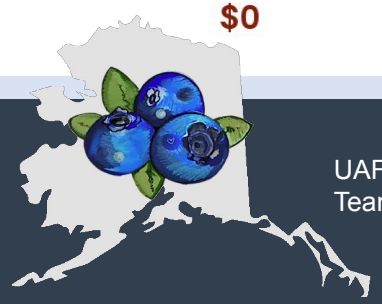
Yearly energy cost of just $240

HERS rating: 17 before renewables, -3 after adding solar

15kW solar + battery system

Integrative passive design strategies, triple pane windows, smart technology

Extreme low temperature air-source heat pumps work with PV system (or the grid)



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HERS Rating image from Ekotrope modeling energy report

Bar graph created by Team Asriavik

Design rendering of VOS Home created with Cedreo software, 2022

EMERGENCY SECURE

Durability & Resiliency
Comfort & Environmental Quality

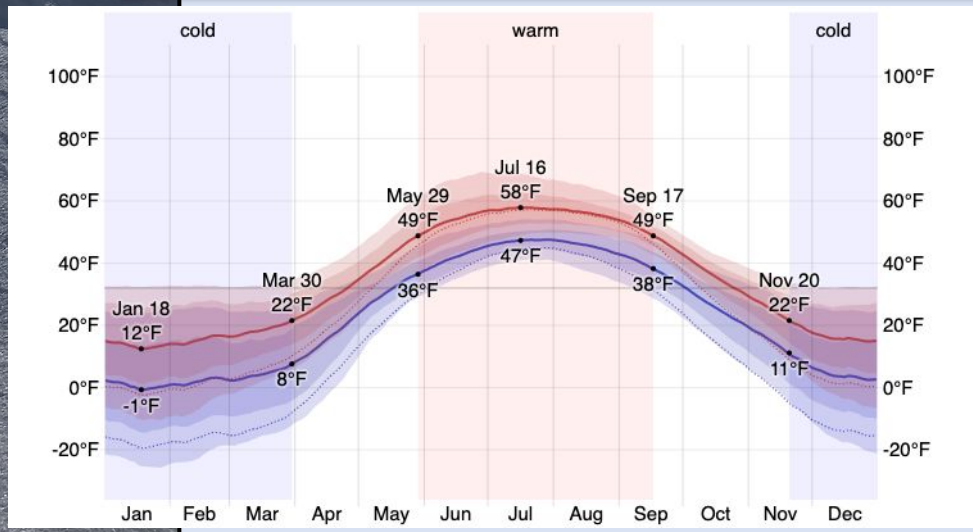
Movable foundation for climate emergencies

Tight building envelope for heat retention during power outages

Egress windows, safe room, emergency exit with drop-down ladder from balcony

Battery backup system to power essential loads

Small wood stove for emergency heat



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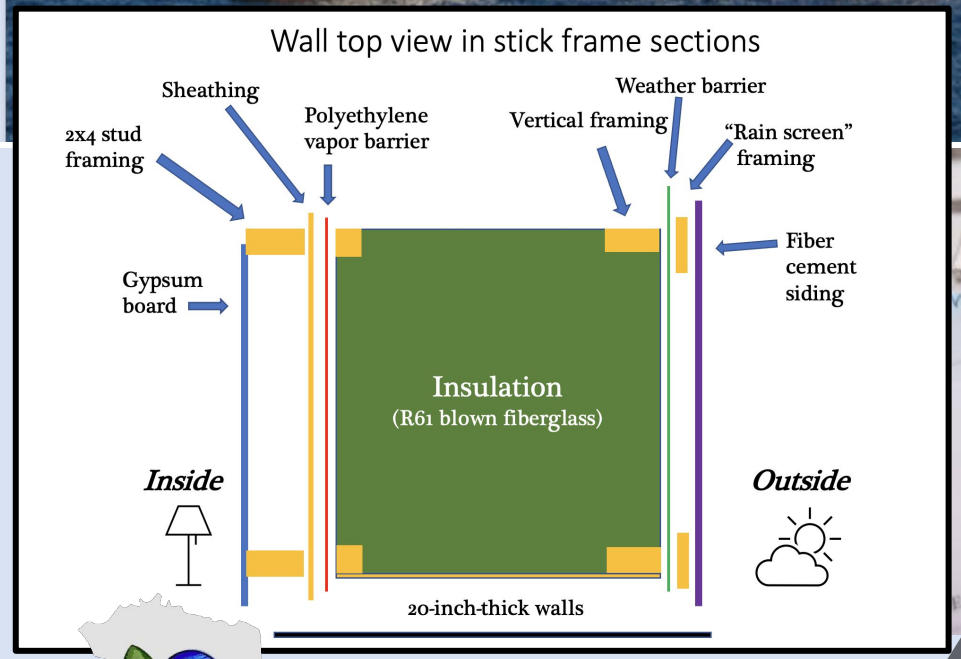
VOS Home design rendering from Cedreo software

Nome, AK year average temperatures, from WeatherSpark

Snow drifts in Nome, AK, winter 2021, by A. Toerdal



REPLICABLE DESIGN

Engineering & Market Analysis

Elevated post and beam foundation above gravel pad; geotextile fabric to address area permafrost

R61 wall insulation

Water sense plumbing throughout

Lease-to-own purchasing model

Accessible cost at $250/ sq. ft., compared to average costs up to $500/sq. ft.

Upcycled shipping containers enhance life span, mitigating new production of raw materials and reduce greenhouse gas emissions

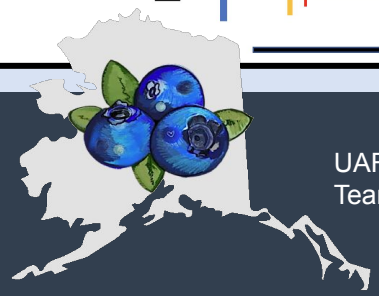


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Photo of barge service to Nome, by Alaska Marine Lines, used with permission, 2022

Wall top view graphic showing R61 insulation, by Team Asriavik

Mortgage graphic stock image, from Canva pro

CONCLUSIONS

Cultural considerations for efficient use of space and multigenerational living

Tight building envelope with R61 insulation for lowest energy usage possible

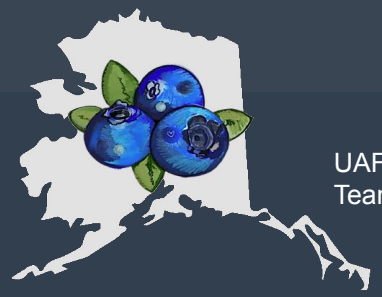
Integrated safety and emergency-conscious design to accommodate a changing, unpredictable climate

Replicable, affordable design that is applicable in many subarctic communities

Top-view rendering of VOS Home design with solar array, from Cedreo software, 2022

THANK YOU QUYANNA

Thank you, industry partners, experts, and advisors, including:
Experts/Research from Cold Climate Housing Research Center
Tyler Boyes, Alaska Housing Finance Corporation
Robin Crist, University of Alaska Southeast
Mike Kruse, Arcadis
Amanda Byrd, Alaska Center for Energy and Power
Tom Marsik, UAF BBC Sustainable Energy Professor
Rohini Brahme, Solar Decathlon Mentor
Jolene Lyon, Bering Strait Housing Authority
Dr. Paul Torcellini and NREL - Building Science Education



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Portraits of Team Asriavik, University of Alaska Fairbanks Solar Design Team and Faculty Advisor Illustrated by Yvette Reyes